



International Partnership  
for Hydrogen and Fuel Cells  
in the Economy

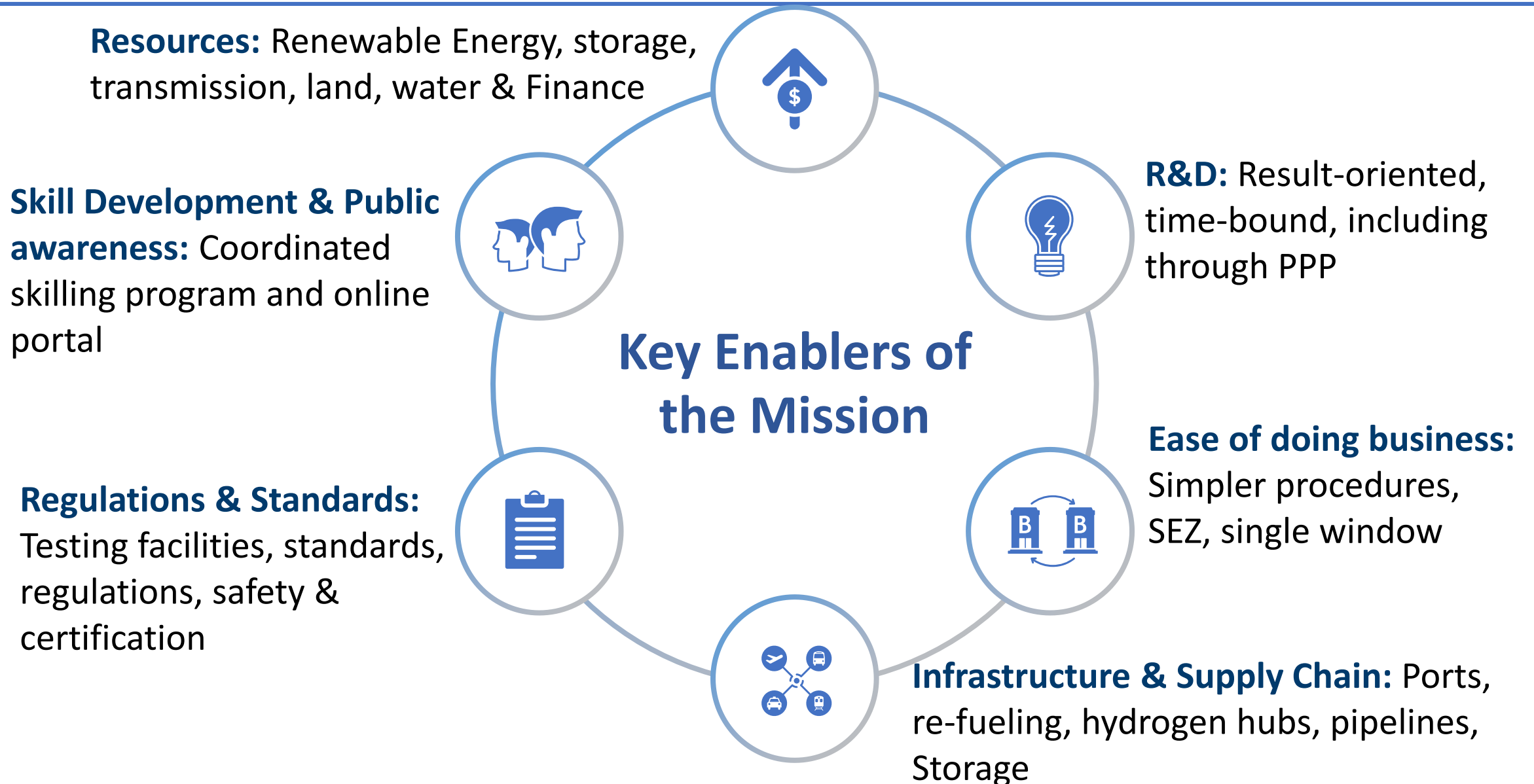
## *India* Update

41<sup>st</sup> IPHE Steering Committee Meeting

19 - 20 March 2024

New Delhi, India

# Key Enablers



# Green Hydrogen Standard for India



“Green Hydrogen” shall mean Hydrogen Produced using Renewable Energy, including, but not limited to, production through:

- a Electrolysis
- b Conversion of biomass



Emissions shall not be greater than 2 kg CO<sub>2</sub> eq/kg H<sub>2</sub>

# SIGHT Programme

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## Green Hydrogen Production

- Bids for 412,000 Tonnes per annum Hydrogen production capacity awarded to 10 Companies
- 200,000 Tonnes of Green Hydrogen consumption by Refineries. Approx 1 MMTPA, by 2030, of demand creation by Petroleum Refineries
- 550,000 Tonnes of Green Ammonia consumption by Fertilisers

## Electrolyser Manufacturing

- 1500 MW per annum of electrolyser manufacturing capacity awarded to 8 Companies
- Additionally, 1500 MW per annum of electrolyser manufacturing bids floated.

# Pilot Projects in Emerging Sectors



## Shipping

- Retrofit 2 ships to run on Green Hydrogen/derived fuels by 2027
- Development of Supply Chain, port infrastructure, Green Ammonia bunkers and re-fueling facilities



## Transport

- Phased deployment of hydrogen fuelled buses & trucks
- Cost of hydrogen fuelled vehicles and associated infrastructure



## Green Steel

Blending of Green Hydrogen  
in  
steel plants – DRI/ Blast  
Furnace

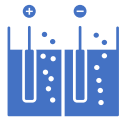
# Skill Development

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- Analyze Green Hydrogen (GH2) skill gaps regularly and maintain the registry of GH2 Skills
- Design GH2 curricula for all levels and Create training materials for GH2 jobs
- Promote industry- led training and on-the-job opportunities
- Utilize existing infrastructure for Green Hydrogen skill training
- Set standards for Green Hydrogen training providers
- Creation of certified pool of trainers across the Green Hydrogen value chain
- Deliver learner-centered Green Hydrogen training programs in consultation with Ministry of Skill Development and Entrepreneurship (MSDE) with placement tracking
- Establish model CoEs for higher level skilling, Training of Trainers (ToT) and support content creation on GH2 ecosystem

# R&D efforts prioritized across key areas

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**High efficiency, low cost electrolyzers**



**Low cost storage and transportation**



**Advanced materials**



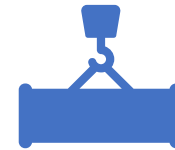
**Hydrogen from biomass**



**Membranes, 3rd Gen electro-Catalysts**



**Fuel Cells**



**Green steel**



**Seawater Electrolysis via innovative chemistry**

# Testing Facilities

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Creation of suitable testing facilities to certify and validate technologies, formulation and regular revision of testing protocols relevant to Indian conditions, adoption of international standards in critical areas and establishment of testing facilities specific to hydrogen and fuel cells at National Testing Centres.

Funding the creation of suitable Test facilities, eg. Electrolyzer Testing, Cylinder testing etc.

Tests for Electrolyzers include: i)Performance ii)Safety and iii)Integrity Tests

Tests for Cylinders include: Tests to check embrittlement, Accelerated Stress Rupture Test, Ambient Temperature Pressure Cycling, Hydrostatic Burst Pressure Test etc.



# Actions already initiated by multiple States

## Actions Initiated by States - Uttar Pradesh

### Draft Green Hydrogen Policy

- 100% exemption from pay
- 50% exemption from indus
- 30% one-time grant suppor
- 100% reimbursement of SG
- 50% exemption from whee
- Additional subsidy of INR 3 percent blending share in

## Actions Initiated by States - Rajasthan

### Draft Green Hydrogen Policy

- Exemption from open acce charges for 14 years
- 20% capital subsidy, for fir Crores
- One-time reimbursement
- Investment Subsidy of 75%
- 100% exemption from pay
- 100% exemption on Stamp

## Actions Initiated by States - MP and Gujrat

### MP | Renewable Energy Policy

- For electrolyser manufact
- Greater than or equal to R equipment manufacturing

### Gujrat | Aatmanirbhar Scheme

- Interest subsidy @ 7% for 8
- 80-100% Net SGST reimburse
- EPF reimbursement - 10 ye
- Electricity duty exemption

## Actions Initiated by States - Tamil Nadu

### Industrial policy

- Special incentives for sunr
- Additional capital subsidy
- 10% and 50% concessional
- 100% stamp duty exemptio
- Up to Rs. 1 crore subsidy d
- Up to Rs. 1 crore reimburs
- Interest Subvention up to
- Electricity tax exemption
- SGST refund on capital goo

## Actions Initiated by States - Odisha

### RE policy, Industrial Policy

- Two Green Hydrogen / Green Ammonia hubs to be developed
- Reimbursement of INR 3.00 per unit of power purchased & consumed from local DISCOMs for 20 years
- Renewable energy consumed for manufacturing of green hydrogen
- Cross subsidy surcharge, additional surcharges & state transmission charges exempted for 20 years
- 100% exemption from payment of Electricity Duty for 20 years from date of commercial production
- 100% exemption from Stamp Duty
- Reimbursement of 100% of net SGST paid, overall limited to 200% of the cost of plant & machinery
- Reimbursement of 100% of employer's contribution towards ESI & EPF Scheme for a period of 7 years

# Green Hydrogen: Recent Initiatives (1/2)

## Projects

- ❑ **Electrolyser:** • ACME (Bikaner) • Oil India (Jorhat & Himachal Pradesh) • L&T (Hazira)  
• IOCL (Panipat, Mathura) • THDC at Rishikesh
- ❑ **Green Ammonia:** • ACME (Bikaner)
- ❑ **Gas Blending:** • GAIL (Indore) • NTPC (Kavas) • Torrent (Gorakhpur) • Adani Total (Ahmedabad)
- ❑ **Hydrogen based Cooking:** NTPC (Greater Noida)
- ❑ **Fuel Cell Buses:** • NTPC (Leh) • IOCL at Fridabad/Delhi • NHPC Fuel cell buses and Refuelling stations at Kargil/Chamba
- ❑ **Fuel Cell Ferry:** Indigenous hydrogen fuel cell ferry launched in February 2024
- ❑ **Ashok Leyland and Reliance** unveil the first heavy-duty truck with Hydrogen Internal Combustion Engine Technology
- ❑ **BPCL and CIAL** setting up the first Green Hydrogen plant at Cochin Airport in Kerala

# Green Hydrogen: Recent Initiatives (2/2)

## Projects

- ❑ Hygenco has established Green Hydrogen plant for Jindal Stainless Steel in Hissar
- ❑ Hydrogen Hubs at Kandla, Tuticorin and Paradip by MoPSW
- ❑ NTPC developing Hydrogen Hub at Pudimadaka
- ❑ Cochin Shipyard developing Hydrogen Fuel Cell powered container vessel for Samskip, a Netherlands based logistic Company
- ❑ Indian Railways to run 35 Hydrogen Trains under “Hydrogen for Heritage”
- ❑ First indigenously manufactured electrolyser, commissioned by L&T Electrolyzers Ltd, Hazira-Gujarat
- ❑ Indigenously manufactured electrolyser, commissioned by Greenzo

# India's competitive advantage in Green Hydrogen

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Single Unified Grid, capable of transferring 116,000 MW power across the country, more capacity being built



India has one of the most competitive RE tariffs in the world (approximately 3 cents per unit)



Long coastline with well-developed ports on east and west coasts



Strategic Location- India is well poised to supply to East Asia as well as Europe

**THANK YOU**